

Abstract

A method is provided for forming a power semiconductor device. The method begins by providing a substrate of a first or second conductivity type and then forming a voltage sustaining region on the substrate. The voltage sustaining region is formed by depositing an epitaxial layer of a first conductivity type on the substrate and forming at least one trench in the epitaxial layer. A barrier material is deposited along the walls of the trench. A dopant of a second conductivity type is implanted through the barrier material into a portion of the epitaxial layer adjacent to and beneath the bottom of the trench. The dopant is diffused to form a first doped layer in the epitaxial layer and the barrier material is removed from at least the bottom of the trench. The trench is etched through the first doped layer. A second doped layer is formed in the same manner as the first doped layer. The second doped layer is located vertically below the first doped layer. A filler material is deposited in the trench to substantially fill the trench. The dopant in the first and second doped layers are diffused to cause the first and second doped layers to overlap one another, thus completing the voltage sustaining region. Finally, at least one region of the second conductivity type is formed over the voltage sustaining region to define a junction therebetween.